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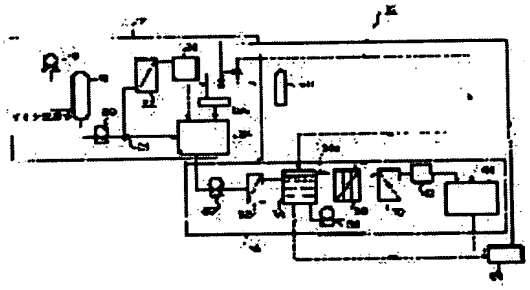
(54) MANUFACTURE AND DEVICE FOR BEVERAGE TO BE STORED IN CONTAINER

(57)Abstract:

PROBLEM TO BE SOLVED: To manufacture the beverage without damaging color tone and flavor in preparing the beverage by heating the beverage at the temperature close to its boiling point, keeping it under the normal pressure so as to remove the gas, and then, performing sterilization at high temperature and pressure to perform sufficient degassing in the sterilization at high temperature for a short time.



SOLUTION: The beverage manufactured by a beverage preparing apparatus 12, e.g. the tea beverage is stored in a container in a degassing, sterilizing, filling and sealing apparatuses 14. The tea beverage stored in a preparing tank 24 by a feed pump 30 is fed to a first plate type heat exchanger 32 under approximately normal pressure, and rapidly heated to the temperature close to its boiling point through heat exchange. After the tea beverage is kept in a temporary storage tank 34 under the normal pressure for a short time, the tea beverage is fed to a second plate type heat exchanger 38 by a force feed pump 36, and kept for the prescribed period of time at the temperature required for sterilization. After the sterilized tea beverage is rapidly cooled to the temperature below the normal temperature by a third plate type heat exchanger 40, it is filled in a can in the atmosphere free from oxygen by a sterile filling apparatus 44.

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The feeding process which feeds a processed drink under abbreviation ordinary pressure, and the preheating process which carries out rapid heating of the processed liquid which feeds at this feeding process to the temperature near [the] the boiling point by heat exchange all over a narrow road, The vacuum treatment which carries out short-time maintenance of the processed drink by which the preheating was carried out at said preheating process under ordinary pressure, and removes the head space gas in a depot temporarily which has a head space in the upper part, The feeding process which feeds the processed drink in which degassing was carried out by this vacuum treatment, and the sterilization process which carries out short-time sterilization processing of the processed drink fed at this feeding process under an elevated temperature 100 degrees C or more and pressurization by heat exchange all over a narrow road, The manufacture approach of the container stuffing drink characterized by having the cooling process which cools quickly immediately the processed drink which sterilization ended, and the aseptic process which carries out aseptic [of the cooled processed drink] to a container [finishing / sterilization] under a sterile ambient atmosphere, severing contact into oxygen substantially, and is sealed.
[Claim 2] A feeding means to feed a processed drink under abbreviation ordinary pressure, and the heat exchanger which carries out rapid heating of the processed liquid fed by this feeding means to the temperature near [the] the boiling point, The depot which can carry out the short-time reservoir of the heated processed liquid where the head space section is held, The degassing means which consists of a means to perform exhaust air from the head space section of this depot, A feeding means to feed the processed drink by which degassing was carried out with this degassing means, The heat exchanger which carries out high-temperature-short-time-pasteurization processing of the processed drink fed by this feeding means under pressurization, The heat exchanger which cools a processed drink [finishing / sterilization] quickly, and the sterile room which has the sterile ambient atmosphere means forming filled up with and sealed in a container [finishing / sterilization] under a sterile ambient atmosphere, severing contact into oxygen for a processed drink [finishing / cooling] substantially, The manufacturing installation of the container stuffing drink characterized by having the aseptic means which consists of the restoration equipment and the sealing devices which are arranged in sterile room.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to amelioration of the manufacture approach of a container stuffing drink and equipment, especially the degassing device in high-temperature-short-time-pasteurization processing.
[0002]
[Description of the Prior Art] About drinks, such as canning and bottling, in order to avoid the putrefaction under storage, it is indispensable to perform sterilization processing. Although the non-heat sterilization which used the filter etc. may be adopted as this sterilization processing in a very special example, heat sterilization is usually performed. There are retort sterilization heated after filling up with and sealing a drink in canning, a bottle, etc. as a method of heat-sterilizing a drink, the hot pack method which fills up a drink with an elevated-temperature condition into a can etc., and seals it immediately with an elevated-temperature condition, and a high-temperature short-time sterilizing method which carries out short-time (about dozens of seconds) maintenance, and sterilizes a drink at 10 degrees C more than 100 before restoration.
[0003] Since said retort sterilization and the hot pack method are sterilized in the state of canning and they become extinct in retort sterilization even if some bacillus contamination arises at the time of restoration, they have the advantage that the production control before and behind restoration is easy. However, it is very difficult after sterilization termination to cool quickly the hot drink in a container with a comparatively large capacity called canning and bottling, a drink is comparatively maintained by the elevated temperature over long duration (for dozens of minutes), and any approach has a fault, like the taste and aroma change.
[0004] On the other hand, a drink is use as a capillary type heat exchange machine, a plate type heat exchange machine, etc. in through and a short time at an elevated temperature, it cools to the inside of a short time further, and a high-temperature short-time sterilizing method has the advantage that the taste and a can drink with a sufficient scent are obtain by fill up and seal and lose the retort sterilization after restoration / seal in a container [finishing / sterilization under a sterile ambient atmosphere], and attracts attention as sterilization of the latest drink can.
[0005]
[Problem(s) to be Solved by the Invention] On the other hand, in order deterioration of a drink is greatly dependent also on dissolved oxygen concentration, for example, to discolor a container stuffing tea drink with time by dissolved oxygen, reduction of dissolved oxygen is strongly demanded with sterilization. Since the amount of dissolved oxygen falls when the temperature of a solution generally goes up, if it is in said hot pack method, degassing is carried out by making it pile up into the thermostat, before being filled up with a drink, but since high temperature processing is carried out to the bottom of pressurization if it is in a high-temperature short-time sterilizing method, degassing of a under [sterilization] is not performed but the oxidation denaturation of coloring matter, an aroma component, etc. based on dissolved oxygen poses a big problem.

[0006] Although degassing of raw material water is conventionally performed as shown in JP,1-317586,A, oxygen may melt again at the time of drink preparation. However, degassing of a prepared drink is not performed, and especially, in drinks which discoloration by oxidation tends to produce, such as a tea drink, since 2 ppm or less extent of dissolved oxygen is quality maintenance, it is demanded. However, it was impossible absolutely to have attained this request by the general reduced pressure degassing method of said former. This invention is made in view of the technical problem of said conventional technique, and the purpose is in offering the manufacture approach of a container stuffing drink with high degassing effectiveness, and equipment in a high-temperature short-time sterilizing method.

[0007]

[Means for Solving the Problem] The manufacture approach of the container stuffing drink applied to this invention in order to attain said purpose The preheating process which carries out rapid heating of the processed liquid which feeds a processed drink with a feeding means to feed under abbreviation ordinary pressure, and this feeding means to the temperature near [the] the boiling point by heat exchange all over a narrow road, The vacuum treatment which carries out short-time maintenance of the processed drink by which the preheating was carried out at said preheating process into the depot temporarily which has a head space in the upper part under ordinary pressure, and removes the head space gas, The feeding process which feeds the processed drink by which degassing was carried out by this vacuum treatment, and the sterilization process which carries out short-time sterilization processing of the processed drink fed by this feeding process under an elevated temperature 100 degrees C or more and pressurization by heat exchange all over a narrow road, It is characterized by having the cooling process which cools quickly immediately the processed drink which sterilization ended, and the aseptic process which carries out aseptic [of said cooled processed drink] to a container [finishing / sterilization], severing contact into oxygen substantially, and is sealed.

[0008] Moreover, a feeding means by which the equipment concerning this invention feeds a processed drink under abbreviation ordinary pressure, The heat exchanger which carries out rapid heating of the processed liquid fed by this feeding means to the temperature near [the] the boiling point, Temporarily which can carry out the short-time reservoir of the heated processed liquid where the head space section is held A depot, The degassing means which consists of a means to perform exhaust air from the head space section of this depot, A feeding means to feed the processed drink by which degassing was carried out with this degassing means, and the heat exchanger which carries out high-temperature-short-time-pasteurization processing of the processed drink fed by this feeding means under pressurization, The heat exchanger which cools a processed drink [finishing / sterilization] quickly, and a processed drink [finishing / cooling] It is characterized by having the aseptic means which consists of the restoration equipment and the sealing devices which are arranged in the sterile room which has the sterile ambient atmosphere means forming filled up with and sealed in a container [finishing / sterilization] under a sterile ambient atmosphere, and sterile room, severing contact into oxygen substantially.

[0009]

[Embodiment of the Invention] The degassing, sterilization and restoration / seal approach and equipment of a container stuffing drink concerning this invention carry out rapid heating of the processed drink to near [the] the boiling point under abbreviation ordinary pressure with a preheating means, as mentioned above. The solubility of the dissolved oxygen in a processed drink falls rapidly in this condition, and it appears as air bubbles by supersaturation thru/or the case. And if it results in the momentary depot of a degassing means, the oxygen in said liquid will be emitted to a head space part, and the oxygen in liquid will be emitted from a depot by removing this head space gas temporarily.

[0010] And the processed drink with which deoxidation was performed is fed in the state of pressurization by the feeding means, and sterilization is performed for a short time by the sterilization means under an elevated temperature 100 degrees C or more under pressurization. In addition, the time amount stored by the depot temporarily is an about short time, i.e., several seconds - about ten seconds. Therefore, the time amount by which a processed drink is maintained by the elevated temperature with a preheating means, a degassing means, and a sterilization means is short, and the denaturation of a

processed liquid in the meantime is suppressed to the minimum. And since the processed drink by which degassing was carried out is a candidate for heating in the sterilization means which carries out sterilization processing under an elevated temperature and pressurization, heating effectiveness is good.
[0011] Hereafter, the suitable embodiment of this invention is explained based on a drawing. The outline configuration of the manufacturing installation of a container stuffing drink this invention takes [drawing 1] like 1 operative condition is shown. The container stuffing beverage production equipment 10 shown in this drawing consists of drink preparation equipment 12, and degassing, sterilization, restoration and the sealing device 14 of a drink.
[0012] And the sealing degassing tub 16 in which, as for said drink preparation equipment 12, ion exchange water was stored, The vacuum pump 18 which puts this sealing degassing tub 16 under reduced pressure, and the sanitary pump 20 which feeds the ion exchange water stored by said sealing degassing tub 16, One side feeds the degassing ion exchange water fed by this sanitary pump 20 into the heat exchanger 22 warmed at 50-80 degrees C through a change-over valve 21. warming fed from said heat exchanger 22 -- the tea-leaves extractor 23 is fed with ion exchange water, and the undiluted solution tank 26 by which the thick tea-leaves extract extracted with said tea-leaves extractor 23 was stored, and the preparation tank 24 which stores the degassing ion exchange water fed into another side through said change-over valve 21 are included. And sequential supply of the ion exchange water and the thick tea-leaves extract by which degassing was carried out to the preparation tank 24 is carried out, and a desired tea drink is adjusted.
[0013] On the other hand, it sets to this invention. Characteristic degassing, sterilization, restoration, and sealing device 14 of a container stuffing drink The feeding pump 30 which constitutes a feeding means, and the 1st plate type heat exchanger 32 which constitutes a preheating means, The feeding pump 36 which constitutes a depot 34 and a feeding means temporarily which constitutes a degassing means, The 2nd plate type heat exchanger 38 which constitutes a sterilization means, and the 3rd plate type heat exchanger 40 which constitutes a cooling means, The aseptic equipment 44 which consists of the restoration equipment and the sealing device which are arranged in a pressure control valve 42, sterile room with the sterile ambient atmosphere means forming which constitutes an aseptic means, and this sterile room is included.
[0014] And said feeding pump 30 feeds into the 1st plate type heat exchanger 32 the prepared tea drink stored by the preparation tank 24 under abbreviation ordinary pressure. This 1st plate type heat exchanger 32 carries out rapid heating of the tea drink fed from the feeding pump 30 to the temperature near [the] the boiling point by heat exchange all over a narrow road. Here, in the case of a tea drink, heating to about 95 degrees C is suitable, and since heating by the heat exchanger 32 is below the boiling point, it does not need to pressurize and should just carry out a temperature up with ordinary pressure.
[0015] Moreover, a depot 34 consists of a tank which has a head space, and short-time maintenance of the tea drink by which the preheating was carried out to this depot 34 by said heat exchanger 32 is carried out under ordinary pressure temporarily [said]. And the head space gas of this depot 34 is removed so that the inside of this depot 34 may not become high pressure from ordinary pressure with the suction pump which omitted illustration. In addition, it also becomes the cause by which it is suitable that the residence time of the tea drink to this depot 34 is several seconds - about ten seconds, dozens of seconds thru/or the time amount by which the need capacity for this depot 34 not only becoming large but a tea drink will be maintained by the elevated temperature if it constitutes so that it may be made to store several minutes become so long, and deterioration of a tea drink progresses. On the other hand, when the capacity of a depot 34 is small to remainder, and the balance of the amount of feeding of the feeding pump 36 and the amount of supply from a heat exchanger 32 collapses, overflow is produced or there is a possibility of producing the fault of air advancing to a heat exchanger 38.
[0016] The feeding pump 36 feeds into the bottom of pressurization the preheating tea drink stored by the depot 34 to the 2nd plate type heat exchanger 38. By this exchanger 38, several seconds cannot be found, and it consists of temperature required for sterilization of a tea drink, for example, 140 degrees C, so that it may hold for dozens seconds. The sterilized tea drink which passed through this exchanger 38

is immediately cooled quickly by the 3rd plate type heat exchanger 40 less than to abbreviation ordinary temperature, for example, 50 degrees C. Therefore, since the time amount by which a tea drink is exposed to the elevated temperature of 10 times more than 100 is dozens of seconds and is [only being exposed to a short-time elevated temperature in the condition of having already deoxidized fully, and] even if it is long, the effect which it has on the aroma component or coloring matter component of a tea drink will become very small.

[0017] The cooling tea drink which passed through said heat exchanger 40 is supplied to aseptic equipment 44 through a heat exchanger 38 and the pressure control valve 42 which maintains the pressure in 40 to high pressure. This aseptic equipment 44 performs the volume bundle of a can top while filling up with the bottom of a sterile and substantial anoxia ambient atmosphere into a can the cooled tea drink supplied through a pressure control valve 42. Of course, before filling up with a tea drink, the inside side is sterilized for the boiler barrel and the can top at least.

[0018] Next, the plate type exchanger used for this embodiment with reference to drawing 2 and drawing 3 is explained briefly. The conceptual diagram of the plate type exchanger 32 is shown in drawing 2 . A tea drink flows through passage 50 and, on the other hand, heat carriers, such as steam, are flowing through passage 52 so that more clearly than this drawing.

[0019] Moreover, between both the passage 50 and 52, the heat transfer plate 54 with high thermal conductivity intervenes. And heat exchange is performed to the tea drink which flows the tea drink root 50 through the heat transfer plate 54 from the heating medium for higher temperature which flows the heat carrier passage 52, and the tea drink with which the temperature up of the heat carrier with which temperature fell was carried out from the outlet of the tea drink passage 50 again flows out of the outlet of the heat carrier passage 52, respectively.

[0020] The more detailed structure of the heat exchanger used for this embodiment is shown in drawing 3 . A tea drink flows in a heat exchanger 32 from passage inlet-port 50a, and flows out from passage outlet 50b so that more clearly than this drawing. On the other hand, elevated-temperature steam advances into a heat exchanger 32 from heat carrier passage inlet-port 52a, and is breathed out from passage outlet 52b. And a tea drink is supplied to the narrow road which many heat transfer plates 54 by which the heat exchanger 32 opened detailed spacing and sealing arrangement was carried out are arranged, for example, is formed in the gap of the heat transfer plates 54a and 54b from lower entrance-side tea drink passage, and this tea drink flows a narrow road to the method of drawing Nakagami, and flows into upside outlet side tea drink passage.

[0021] On the other hand, the narrow gap is formed also between this heat transfer plate 54b and electric heat plate 54c which adjoined that opposite side, a heating medium for higher temperature is supplied to this narrow road from the upside entrance-side heat carrier passage 52, and this heating medium for higher temperature flows a narrow road to the method of drawing Nakashita, and flows into outlet side heat carrier passage 52b. Therefore, a tea drink and a heat carrier are [only being separated by thin heat transfer plate 54b and], and they will run to hard flow, a tea drink and a heat carrier carrying out heat exchange through heat transfer plate 54b.

[0022] As mentioned above, the narrow road where a tea drink flows, and the narrow road where a heat carrier flows have structure arranged by turns, and the heat exchanger used in this embodiment can make homogeneity and an efficient temperature up perform about a lot of tea drinks for a short time. [much] this operative condition -- the manufacturing installation of the container stuffing drink applied like -- an outline -- it is constituted as mentioned above, and these are operated as follows and a container stuffing drink is manufactured.

[0023] As mentioned above, the manufacture approach of the container stuffing drink concerning this embodiment heats a processed drink quickly even to the temperature near [the] the boiling point by the 1st plate type heat exchanger 32. Under the present circumstances, in order that the solubility of the gas in a water solution may decrease with the rise of temperature, most dissolved oxygen will be in the condition of supersaturation thru/or detailed air bubbles with heating by the heat exchanger 32. By emitting the tea drink of this condition to a depot 34 temporarily, the oxygen in said liquid is emitted to the head space part of this depot 34 upper part. Therefore, most dissolved oxygen in a tea drink will be

removed by removing this head space gas.
[0024] For example, the dissolved oxygen of ion exchange water and the relation of temperature are shown in drawing 4 . It is 9 ppm at 20 degrees C so that more clearly than this drawing. For that in which the dissolved oxygen of extent existed, at the temperature of 60 degrees C, dissolved oxygen concentration is 1 ppm in 5 ppm and the temperature of 95 degrees C. It becomes extent. therefore -- the temperature of the tea drink in the preparation tank 24 is 60 degrees C -- dissolved oxygen -- 5 ppm it was -- if the temperature up of the tea drink is carried out for a thing to 95 degrees C in a heat exchanger 32 -- dissolved possible oxygen -- 1 ppm since it becomes -- 4 ppm of difference Surplus dissolved oxygen serves as the shape of supersaturation thru/or detailed air bubbles. 2 ppm of dissolved oxygen The following has a big meaning on the quality of tea canning, and is especially 1 ppm. Also for example, in a tea drink etc., it is very hard to produce deterioration over a long period of time, and the following is an oxygen density very effective for the improvement in shelf life. If it is poured into a depot 34 in this condition temporarily, said surplus dissolved oxygen will be emitted to the head space part of this depot 34.
[0025] On the other hand in the depot 34, the sterile nitrogen gas disinfected with the filter is supplied from the nitrogen gas cylinder 60, and the air (oxygen) emitted to said head space part out of the tea drink is discharged out of a system from opening 34a with nitrogen gas. And dissolved oxygen is 2 ppm. The preparation liquid reduced below is fed by the 2nd plate type heat exchanger 38 with the feeding pump 36. Although this heat exchanger 38 consists of the same heat exchangers as said 1st plate type heat exchanger 32, in order to consider as the elevated temperature more than the ordinary pressure boiling point of preparation liquid, the pump 36 is pressurizing so that preparation liquid may not boil.
[0026] 2 ppm of dissolved oxygen concentration obtained as mentioned above The following tea drinks are supplied to aseptic equipment 44 through a pressure control valve 42, after being immediately cooled by the 3rd plate type heat exchanger 40. This aseptic equipment 44 consists of the restoration equipment and the sealing devices which were installed in sterile room and this sterile room, and fills up with and seals a tea drink at a sterile container. In addition, the sterile nitrogen gas which passed the intermediate filter also to said aseptic equipment 44, and was disinfected from said nitrogen POMBE 60 is supplied, where contact into oxygen is severed substantially, a can is filled up with a tea drink, and it is sealed by the can top.
[0027] As explained above, in order according to the manufacture approach of the container stuffing drink concerning this embodiment to make a processed drink pile up near [the] the boiling point under ordinary pressure, to perform degassing in the meantime and to perform still more sufficient sterilization in the bottom of pressurization and high pressure, the preparation liquid with which it fills up with aseptic equipment 44 fully becomes sterilization and the thing by which degassing was carried out. In addition, although sterile nitrogen gas was supplied to the head space part of a depot 34 in this embodiment, it is also suitable to carry out bubbling within a depot 34 temporarily, for example. Moreover, in order to plan completeness of degassing more, in this embodiment, sterile nitrogen gas is supplied also in the preparation tank 24.
[0028] Moreover, the degassing effectiveness stabilized further has been acquired by forming an oxygen analyzer 64 in a depot 34 and aseptic equipment 44 in this embodiment temporarily, and controlling nitrogen gas supply volume so that the oxygen density in each process does not become more than fixed. In addition, it is suitable to use the thing of structure as shown in drawing 5 as a depot 34 in this embodiment temporarily.
[0029] That is, a depot 34 establishes the outflow way 72 in the depot 34 lower part at the lower part of the inflow way 70 and its opposite side, and the septum 74 is formed between both the passage 70 and 72 temporarily which is shown in this drawing. For this reason, the drink which flows from the inflow way 70 is barred by the septum 74, results in an oil level (contact surface with a head space) once, and after sufficient degassing is performed, it is fed into the 2nd plate type heat exchanger 38 from the outflow way 72. For this reason, moreover, degassing effectiveness also becomes high, without generating a liquid reservoir in the depot 34 interior temporarily.
[0030]

[Example] Hereafter, one example of this invention is explained based on drawing 6 . It sets in the example shown in this drawing, and is 0.9 ppm of dissolved oxygen concentration. After adding green tea 1.25% to ion exchange water and performing extract processing for 5 minutes at 70 degrees C, addition of filtration, cooling, sodium bicarbonate, and L-ascorbic acid is performed, and a tea drink is prepared. In spite of having used degassing ion exchange water for this prepared tea drink, dissolved oxygen concentration is 6.0 ppm. It has become. on the other hand -- the case (conventional technique 1) where it sterilizes using the retort sterilization generally used conventionally -- the dissolved oxygen concentration at the time of a hot pack (restoration temperature of 90 degrees C) -- 1.6 ppm -- further -- the dissolved oxygen concentration after retort sterilization (121 degree-Cx 10 minutes) -- 0.4 ppm it was .

[0031] moreover -- the case (conventional technique 2) where carried out high-temperature short-time pasteurization of said prepared tea drink as it was, and ordinary temperature restoration is carried out -- the dissolved oxygen concentration after restoration -- 5.1 ppm it is -- dissolved oxygen concentration is very high and the oxidation under preservation is expected. the dissolved oxygen concentration when said prepared tea drink is filled up with the approach concerning this invention into a can on the other hand and nitrogen gas permutes a head space, after the dissolved oxygen concentration in a depot 34 performing further 1.8 the elevated temperature and ppm of high-pressure sterilization temporarily and carrying out ordinary temperature restoration -- 0.9 ppm it was .

[0032] About the tea drink manufactured as mentioned above, the variation of a value and L-ascorbic acid was investigated at the time of room temperature three-month preservation at the time of room temperature one-month preservation at the time of manufacture (after sterilization) at the time of preparation (before sterilization), respectively. The result is shown in the next Table 1 and 2.

[0033]

[Table 1]

a値の変化量

貯蔵期間	製造区分		
	従来技術1	従来技術2	本発明
調合時（殺菌前）	0.00		
製造時（殺菌後）	1.41	0.21	0.15
室温×1ヶ月	2.03	0.63	0.19
室温×3ヶ月	2.42	0.80	0.22

In addition, a value is a Lab colorimetry system, a hue (red - green) is expressed and when a value increases shows that the browning degree increased.

[0034]

[Table 2]

Ｌ－アスコルビン酸の変化量（単位ｍｇ％）

貯蔵期間	製造区分		
	従来技術１	従来技術２	本発明
調合時（殺菌前）	０．００		
製造時（殺菌後）	４．８６	３．５０	０．８６
室温×１ヶ月	７．０３	９．７８	１．５２
室温×３ヶ月	９．３２	１０．８０	２．１６

[0035]
[Table 3]
フレーバーテスト結果（三点識別嗜好法）

貯蔵期間		テスト区分		
		従来技術１：従来技術２	従来技術１：本発明	従来技術２：本発明
製造時（殺菌後）	識別	＊＊＊	＊＊＊	＊＊
	嗜好	従来技術２を好む ＊＊＊	本発明を好む ＊＊＊	本発明を好む ＊＊
室温１ヶ月	識別	＊＊	＊＊＊	＊＊
	嗜好	従来技術２を好む ＊＊	本発明を好む ＊＊＊	本発明を好む ＊＊
室温３ヶ月	識別	＊＊	＊＊＊	＊
	嗜好	従来技術２を好む ＊	本発明を好む ＊＊＊	本発明を好む ＊

＊＊＊ : It is 0.1% of level of significance, and they are those with a significant difference.
＊＊ : It is 1.0% of level of significance, and they are those with a significant difference.
＊ : it is 5.0% of level of significance, and they are those with a significant difference.
[0036] In addition, the organoleptic test performed the repeat test 3 times per person by 20 research workers trained daily [the lab to which an artificer belongs]. It became clear that degradation of a drink is progressing remarkably also by the result of a flavor test as the variation of a value and L-ascorbic

acid is very large and it is further shown in said table 3 so that more clearly than said Table 1 and 2. In addition, if said drawing 6 is referred to, it sets on the conventional technique 1 and the dissolved oxygen concentration after restoration is 0.4 ppm. It became, and although it was low, this suggests that dissolved oxygen was almost reacted and consumed in retort sterilization, and although there was still less dissolved oxygen after restoration, it became clear that the deterioration under storage progresses quickly.

[0037] On the other hand, in the conventional technique 2, if a value change is seen, said about one conventional technique large variation is not shown, but since the dissolved oxygen concentration after restoration is remarkably high as shown in drawing 6 , consumption of the L-ascorbic acid under storage is remarkable, and also increasing a value gradually is understood. The dissolved oxygen concentration of this invention after restoration is also low to these conventional techniques 1 and 2, the variation of a value and L-ascorbic acid is remarkably smaller still as compared with said conventional technique, and it is clear that a large improvement and maintenance of quality are achieved.

[0038] In addition, although explained taking the case of the tea drink in said embodiment and example This invention is not what is restricted to this. Coffee (entering milk and black), A tea drink (green tea, oolong tea, tea), barley tea, various mixed tea, cocoa, The drink set as the object of current retort sterilization, such as milk shake, soup, cow's milk (milk beverage), soybean milk, sweet drink made from fermented rice, and miso soup, It cannot be overemphasized that it can apply also about the can drink furthermore set as the object of high-temperature short-time pasteurization, such as a fruits drink, a sport drink, a pasteurized lactic beverage, and a tomato, vegetable juice, and the hot pack method. Furthermore, although the plate type heat exchanger was used as a heat exchanger in said embodiment, it is also possible to use a capillary type heat exchanger, for example.

[0039]

[Effect of the Invention] As explained above, after carrying out remaining heat to near the boiling point of a processed drink according to the manufacture approach of the container stuffing drink concerning this invention, it holds and deaerates under ordinary pressure, and since sterilization sufficient further after that for the bottom of an elevated temperature and pressurization is performed, it becomes possible to perform sufficient degassing in high-temperature short-time pasteurization. Therefore, it can manufacture, without hardly spoiling the color tone at the time of preparation of a drink, and a flavor by this invention approach, and it becomes possible to stabilize and save the above-mentioned component during storage of a container stuffing drink, since there is little dissolved oxygen. Moreover, according to the manufacturing installation of the container stuffing drink concerning this invention, a container stuffing drink can be manufactured, without hardly spoiling the color tone at the time of preparation, and a flavor.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram of the can beverage production equipment used for the manufacture approach of the container stuffing drink which takes like 1 operative condition as for this invention.
[Drawing 2] It is the explanatory view of the concept of a heat exchanger used for the preheating means shown in drawing 1 , a sterilization means, and a cooling means.
[Drawing 3] It is the explanatory view of a plate type heat exchanger used for the equipment shown in drawing 1 .
[Drawing 4] It is the explanatory view of the relation between the temperature of ion exchange water, and dissolved oxygen concentration.
[Drawing 5] It is the explanatory view of a depot temporarily which is used for the equipment shown in drawing 1 .
[Drawing 6] They are the green tea canned production process of this invention and the conventional technique, and the comparison Fig. of dissolved oxygen concentration.
[Description of Notations]
14 Drink Degassing, Sterilization, Restoration, and Sealing Device
30 Feeding Pump (Feeding Means)
32 1st Plate Type Heat Exchanger (Preheating Means)
34 Momentary Depot (Degassing Means)
36 Feeding Pump (Feeding Means)
38 2nd Plate Type Heat Exchanger (Sterilization Means)
40 3rd Plate Type Heat Exchanger (Cooling Means)
44 Aseptic Equipment (Aseptic Means)

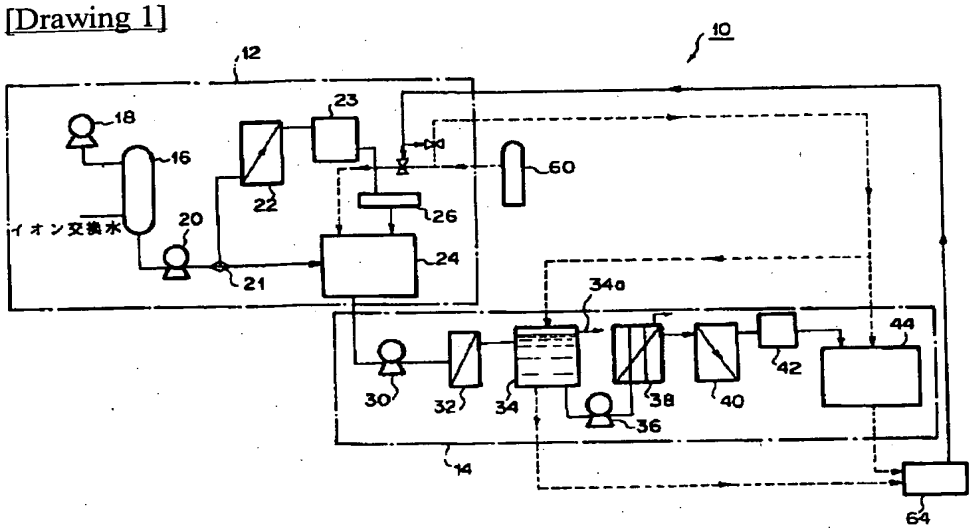
[Translation done.]

* NOTICES *

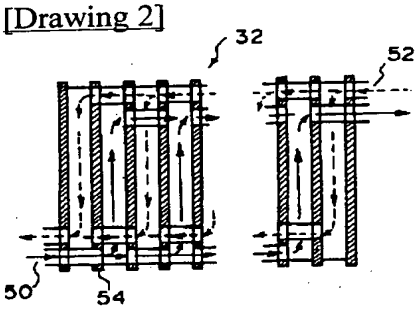
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

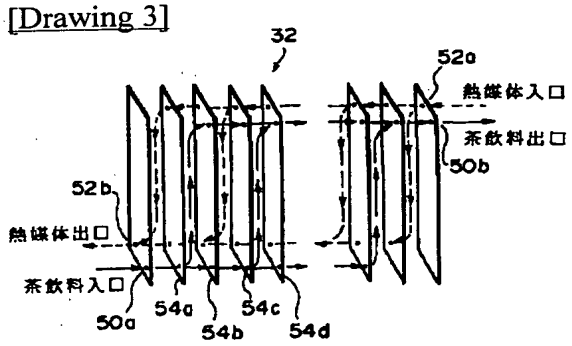
[Drawing 1]



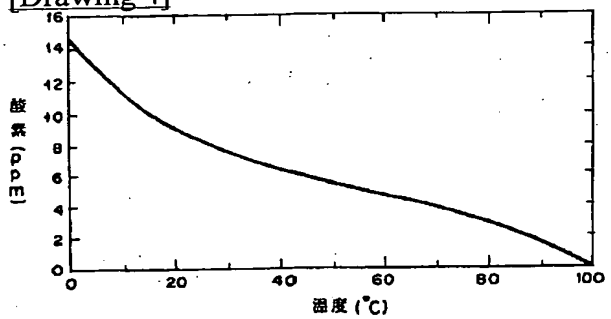
[Drawing 2]



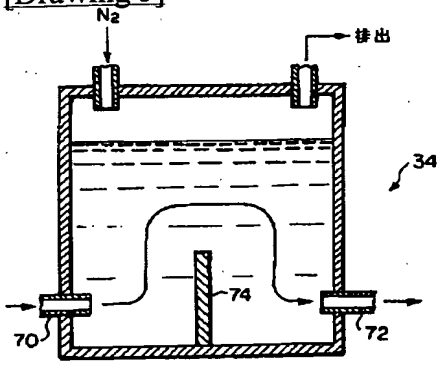
[Drawing 3]



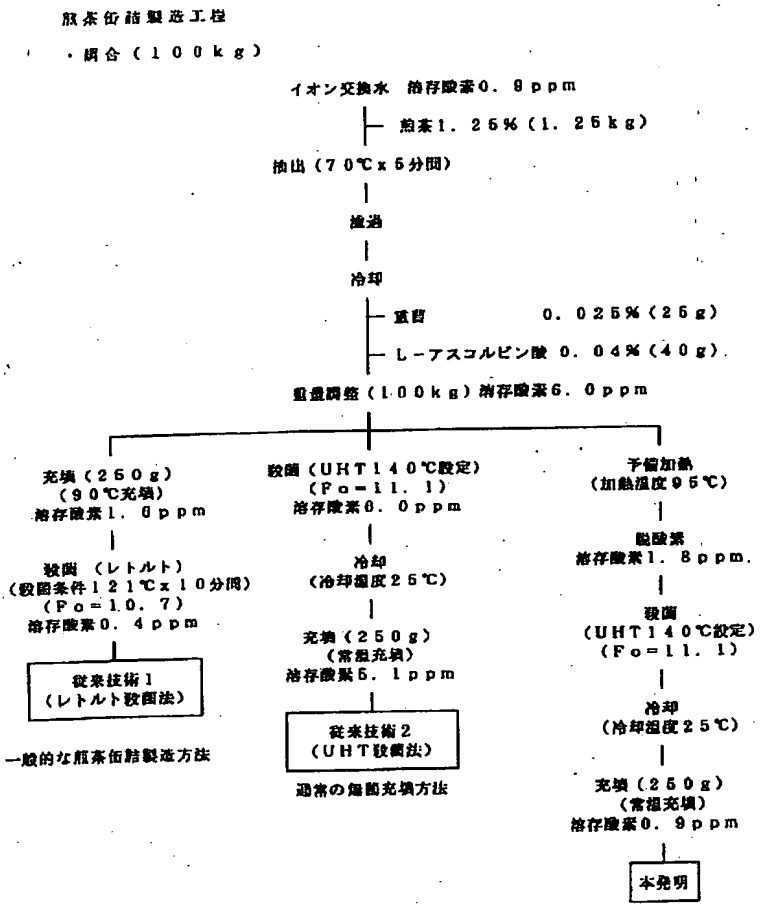
[Drawing 4]



[Drawing 5]



[Drawing 6]



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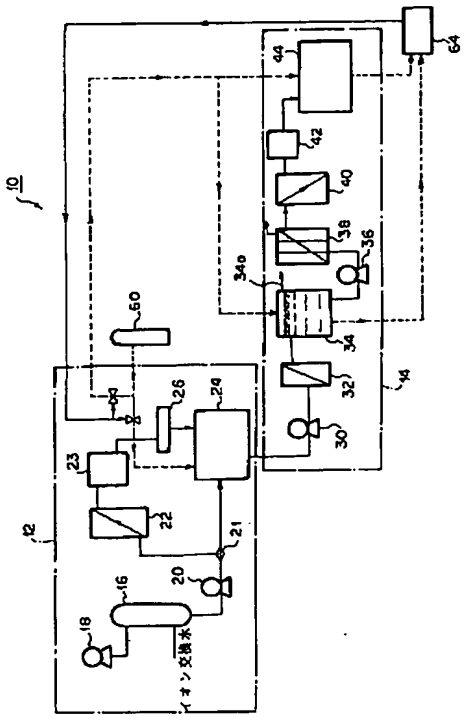
(54)【発明の名称】容器詰め飲料の製造方法及び装置

(57)【要約】
【課題】本発明の目的は、高温短時間殺菌法において脱気効率の高い容器詰め飲料の製造方法及び装置を提供することにある。
【解決手段】被処理飲料を略常圧下で送給する送給手段３０と、前記送給手段３０により送給される被処理液を狭路中で熱交換によりその沸点近傍の温度まで急速加熱する予熱手段３２と、上部にヘッドスペースを有する一時貯留槽３４に前記予熱手段３２により予熱された被処理飲料を常圧下に短時間保持し、そのヘッドスペースガスを除去する脱気手段と、前記脱気手段により脱気された被処理飲料を圧送する圧送手段３６と、前記圧送手段３６により圧送される被処理飲料を狭路中で熱交換により１００℃以上の高温、加圧下に短時間殺菌処理する殺菌手段３８と、前記殺菌が終了した被処理飲料を急速冷却する冷却手段４０と、前記冷却された被処理飲料を、無菌室内で実質的に酸素との接触を絶ちつつ無菌容器に充填し密封する無菌充填手段４４と、を備えたことを特徴とする容器詰め飲料の製造方法及び装置。



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【特許請求の範囲】
【請求項１】　被処理飲料を略常圧下で送給する送給工程と、
該送給工程で送給する被処理液を狭路中で熱交換によりその沸点近傍の温度まで急速加熱する予熱工程と、
上部にヘッドスペースを有する一時貯留槽内に、前記予熱工程で予熱された被処理飲料を常圧下に短時間保持し、そのヘッドスペースガスを除去する脱気工程と、
該脱気工程により脱気された被処理飲料を圧送する圧送工程と、
該圧送工程で圧送される被処理飲料を狭路中で熱交換により１００℃以上の高温、加圧下で短時間殺菌処理する殺菌工程と、
殺菌が終了した被処理飲料を直ちに急速冷却する冷却工程と、
冷却された被処理飲料を、実質的に酸素との接触を絶ちつつ無菌雰囲気下で殺菌済みの容器に無菌充填し、密封する無菌充填工程と、
を備えたことを特徴とする容器詰め飲料の製造方法。
【請求項２】　被処理飲料を略常圧下で送給する送給手段と、
該送給手段により送給される被処理液をその沸点近傍の温度まで急速加熱する熱交換器と、
加熱された被処理液をヘッドスペース部を保持した状態で短時間貯留し得る貯留槽と、該貯留槽のヘッドスペース部から排気を行う手段とから成る脱気手段と、　該脱気手段により脱気された被処理飲料を圧送する圧送手段と、
該圧送手段により圧送される被処理飲料を加圧下で高温短時間殺菌処理する熱交換器と、
殺菌済みの被処理飲料を急速に冷却する熱交換器と、
冷却済みの被処理飲料を、実質的に酸素との接触を絶ちつつ無菌雰囲気下で殺菌済みの容器に充填・密封する無菌雰囲気形成手段を有する無菌室と、無菌室内に配置されている充填装置及び密封装置とから構成される無菌充填手段と、
を備えたことを特徴とする容器詰め飲料の製造装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は容器詰め飲料の製造方法及び装置、特に高温短時間殺菌処理における脱気機構の改良に関する。
【０００２】
【従来の技術】缶詰、瓶詰等の飲料については、貯蔵中の腐敗を避けるため殺菌処理を行うことが必須である。この殺菌処理には、ごく特殊な例ではフィルターなどを用いた非加熱殺菌を採用することもあるが、通常は加熱殺菌が行われる。飲料の加熱殺菌法としては、飲料を缶詰、瓶詰等に充填、密封した後に加熱するレトルト殺菌法、飲料を高温状態で缶などに充填し高温状態のまま直

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ちに密封するホットパック法、及び充填前に飲料を例えば百数十℃で短時間（数十秒程度）維持して殺菌する高温短時間殺菌法がある。
【０００３】前記レトルト殺菌法及びホットパック法は、缶詰状態で殺菌されるため、充填時に多少の菌汚染が生じたとしてもレトルト殺菌中に死滅することから、充填前後における工程管理が容易であるという利点がある。しかしながら、何れの方法も、殺菌終了後に缶詰、瓶詰という比較的容量の大きい容器中の高温の飲料を急速に冷却することは極めて困難であり、飲料が比較的長時間（数十分間）にわたり高温に維持され、味、香りが変わるなどの欠点がある。
【０００４】一方、高温短時間殺菌法は、飲料を細管式熱交換機、プレート式熱交換機などに通し、短時間で高温にし、さらに短時間の内に冷却し、無菌雰囲気下で殺菌済みの容器に充填・密封して、充填・密封後のレトルト殺菌をなくすことにより味、香りのよい缶飲料が得られるという利点を有し、最近の飲料缶の殺菌法として注目されている。
【０００５】
【発明が解決しようとする課題】一方、飲料の変質は溶存酸素濃度にも大きく依存しており、例えば容器詰め茶飲料は、溶存酸素によって経時的に変色するため、殺菌と共に溶存酸素の低減が強く要望されている。一般に溶液の温度が上がることにより溶存酸素量は低下するため、前記ホットパック法にあっては、飲料を充填前に高温槽中に滞留させることにより脱気されるが、高温短時間殺菌法にあっては加圧下に高温処理されるため殺菌中での脱気は行われず、溶存酸素に基づく色素、香気成分などの酸化変性が大きな問題となっている。
【０００６】従来より、例えば特開平１－３１７５８６号に示されるように原料水の脱気は行われているが、飲料調合時に酸素が再度とけ込む可能性がある。ところが、調合済み飲料の脱気は行われておらず、また、特に茶飲料など、酸化による変色が生じやすい飲料においては、溶存酸素２ppm以下程度が品質保持のため要望されている。しかし、前記従来の一般的な減圧脱気法ではこの要望を達成することは到底不可能であった。本発明は前記従来技術の課題に鑑みなされたものであり、その目的は高温短時間殺菌法において脱気効率の高い容器詰め飲料の製造方法及び装置を提供することにある。
【０００７】
【課題を解決するための手段】前記目的を達成するために本発明にかかる容器詰め飲料の製造方法は、被処理飲料を略常圧下で送給する送給手段と、該送給手段で送給する被処理液を狭路中で熱交換によりその沸点近傍の温度まで急速加熱する予熱工程と、上部にヘッドスペースを有する一時貯留槽内に前記予熱工程で予熱された被処理飲料を常圧下に短時間保持し、そのヘッドスペースガスを除去する脱気工程と、該脱気工程で脱気された被処

理飲料を圧送する圧送工程と、該圧送工程により圧送される被処理飲料を狭路中で熱交換により１００℃以上の高温、加圧下で短時間殺菌処理する殺菌工程と、殺菌が終了した被処理飲料を直ちに急速冷却する冷却工程と、前記冷却された被処理飲料を、実質的に酸素との接触を絶ちつつ殺菌済みの容器に無菌充填し、密封する無菌充填工程と、を備えたことを特徴とする。

【０００８】また、本発明にかかる装置は、被処理飲料を略常圧下で送給する送給手段と、該送給手段により送給される被処理液をその沸点近傍の温度まで急速加熱する熱交換器と、加熱された被処理液をヘッドスペース部を保持した状態で短時間貯留し得る一時貯留槽と、該貯留槽のヘッドスペース部から排気を行う手段とから成る脱気手段と、該脱気手段により脱気された被処理飲料を圧送する圧送手段と、該圧送手段により圧送される被処理飲料を加圧下で高温短時間殺菌処理する熱交換器と、殺菌済みの被処理飲料を急速に冷却する熱交換器と、冷却済みの被処理飲料を、実質的に酸素との接触を絶ちつつ無菌雰囲気下で殺菌済みの容器に充填・密封する無菌雰囲気形成手段を有する無菌室と無菌室内に配置されている充填装置及び密封装置とから構成される無菌充填手段と、を備えたことを特徴とする。

【０００９】

【発明の実施の形態】本発明にかかる容器詰め飲料の脱気・殺菌・充填・密封方法及び装置は、前述したように予熱手段により略常圧下で被処理飲料をその沸点近傍まで急速加熱する。この状態で被処理飲料中の溶存酸素の溶解度は急激に低下し、過飽和ないし場合により気泡として出現する。そして、脱気手段の一時貯留槽に至ると、前記液中酸素はヘッドスペース部分に放出され、該ヘッドスペースガスが除去されることにより液中酸素は一時貯留槽から放出される。

【００１０】そして、脱酸素が行われた被処理飲料は圧送手段により加圧状態で送給され、殺菌手段により加圧下に１００℃以上の高温下で短時間に殺菌が行われる。なお、一時貯留槽に貯留される時間は短時間、すなわち、数秒～十数秒程度である。従って、予熱手段、脱気手段、及び殺菌手段で被処理飲料が高温に維持される時間は短く、この間の被処理液の変性は最小限に抑えられる。しかも、高温、加圧下に殺菌処理する殺菌手段においては、脱気された被処理飲料が加熱対象であるので、加熱効率がよい。

【００１１】以下、図面に基づき本発明の好適な実施態様について説明する。図１は本発明の一実施態様にかかる容器詰め飲料の製造装置の概略構成が示されている。同図に示す容器詰め飲料製造装置１０は、飲料調合装置１２と、飲料の脱気・殺菌・充填・密封装置１４とからなる。

【００１２】そして、前記飲料調合装置１２は、イオン交換水が貯留された密閉脱気槽１６と、該密閉脱気槽１６を減圧下に置く真空ポンプ１８と、前記密閉脱気槽１６に貯留されたイオン交換水を送給するサニタリーポンプ２０と、該サニタリーポンプ２０により送給される脱気イオン交換水を切換弁２１を介して一方は５０～８０℃に加温する熱交換器２２に送給し、前記熱交換器２２から送給される加温イオン交換水を茶葉抽出装置２３に給送し、前記茶葉抽出装置２３で抽出された濃厚茶葉抽出液が貯留された原液タンク２６と、前記切換弁２１を介して他方に送給される脱気イオン交換水を貯留する調合タンク２４とを含む。そして、調合タンク２４には脱気されたイオン交換水と濃厚茶葉抽出液が順次供給され、所望の茶飲料が調整される。

【００１３】一方、本発明において特徴的な容器詰め飲料の脱気・殺菌・充填・密封装置１４は、送給手段を構成する送給ポンプ３０と、予熱手段を構成する第１プレート式熱交換器３２と、脱気手段を構成する一時貯留槽３４と、圧送手段を構成する圧送ポンプ３６と、殺菌手段を構成する第２プレート式熱交換器３８と、冷却手段を構成する第３プレート式熱交換器４０と、圧力制御弁４２と、無菌充填手段を構成する無菌雰囲気形成手段をもつ無菌室と該無菌室内に配置されている充填装置及び密封装置とから成る無菌充填装置４４とを含む。

【００１４】そして、前記送給ポンプ３０は、調合タンク２４に貯留された調合済み茶飲料を略常圧下で第１プレート式熱交換器３２へ送給する。該第１プレート式熱交換器３２は、送給ポンプ３０より送給される茶飲料を狭路中で熱交換によりその沸点近傍の温度まで急速加熱する。ここで、茶飲料の場合には例えば９５℃程度まで加熱することが好適であり、熱交換器３２での加熱は沸点以下であるので、加圧を行う必要はなく常圧のまま昇温すればよい。

【００１５】また、前記一時貯留槽３４はヘッドスペースを有するタンクよりなり、該貯留槽３４には前記熱交換器３２で予熱された茶飲料が常圧下に短時間保持される。そして、該貯留槽３４のヘッドスペースガスは図示を省略した吸引ポンプ等により該貯留槽３４内が常圧よりも高圧にならないように除去される。なお、該貯留槽３４への茶飲料の滞留時間は数秒～十数秒であることが好適であり、数十秒ないし数分貯留させるように構成すると該貯留槽３４の必要容量が大きくなるばかりでなく、茶飲料が高温に維持される時間がそれだけ長くなり、茶飲料の変質が進む原因ともなる。一方、貯留槽３４の容量が余りに小さいと、圧送ポンプ３６の送給量と熱交換器３２からの供給量のバランスが崩れた場合にオーバーフローを生じたりあるいは熱交換器３８へ空気が進入してしまう等の不具合を生じるおそれがある。

【００１６】圧送ポンプ３６は、貯留槽３４に貯留された予熱茶飲料を加圧下に第２プレート式熱交換器３８へ送給する。該交換器３８では茶飲料の殺菌に必要な温度、例えば１４０℃で数秒ないし数十秒保持するように

構成されている。この交換器３８を経た殺菌済茶飲料は直ちに第３プレート式熱交換器４０により略常温、例えば５０℃以下まで急速冷却される。従って、茶飲料が百数十度の高温にさらされる時間は長くても数十秒であり、すでに十分に脱酸素された状態で短時間高温にさらされるのみであるので、茶飲料の香気成分あるいは色素成分に与える影響は極めて小さいものとなる。

【００１７】前記熱交換器４０を経た冷却茶飲料は熱交換器３８，４０内の圧力を高圧に維持する圧力制御弁４２を介して無菌充填装置４４に供給される。この無菌充填装置４４は、圧力制御弁４２を介して供給される冷却済茶飲料を無菌かつ実質的な無酸素雰囲気下で缶に充填すると共に、缶蓋の巻締めを行う。むろん、茶飲料が充填される前に缶胴および缶蓋共に少なくとも内面側が殺菌されている。

【００１８】次に、図２および図３を参照して本実施態様に用いられるプレート式交換器について簡単に説明する。図２にはプレート式交換器３２の概念図が示されている。同図より明らかなように、茶飲料は流路５０を介して流れ、一方スチーム等の熱媒体は流路５２を介して流れている。

【００１９】また、両流路５０，５２の間には、熱伝導率の高い伝熱プレート５４が介在している。そして、熱媒体流路５２を流れる高温熱媒体より伝熱プレート５４を介して茶飲料ルート５０を流れる茶飲料に熱交換が行われ、熱媒体流路５２の出口からは温度の下がった熱媒体が、また茶飲料流路５０の出口からは昇温された茶飲料がそれぞれ流出される。

【００２０】図３には本実施態様に用いられる熱交換器のより詳細な構造が示されている。同図より明らかなように、茶飲料は流路入口５０ａより熱交換器３２内に流入し、流路出口５０ｂより流出される。一方、高温スチームは熱媒体流路入口５２ａより熱交換器３２内に進入し、流路出口５２ｂより吐出される。そして、熱交換器３２は微細な間隔をあけて密閉配置された伝熱プレート５４が多数配置されており、例えば伝熱プレート５４ａ，５４ｂの間隙で形成される狭路には下部の入口側茶飲料流路より茶飲料が供給され、該茶飲料は狭路を図中上方に流れ、上部の出口側茶飲料流路に流れ込む。

【００２１】一方、該伝熱プレート５４ｂと、その反対側に隣接した電熱プレート５４ｃの間にも狭い間隙が形成されており、この狭路には上部の入口側熱媒体流路５２より高温熱媒体が供給され、該高温熱媒体は狭路を図中下方に流れ、出口側熱媒体流路５２ｂに流れ込む。従って、茶飲料と熱媒体は薄い伝熱プレート５４ｂにより隔てられているのみであり、茶飲料と熱媒体が伝熱プレート５４ｂを介して熱交換しつつ逆方向に進行することとなる。

【００２２】本実施態様において用いられる熱交換器は、前述したように茶飲料が流れる狭路と熱媒体が流れる狭路が交互に多数配置された構造となっており、大量の茶飲料について短時間で均一かつ効率的な昇温を行わせることができる。本実施態様に係る容器詰め飲料の製造装置は概略以上のように構成されており、これらを次のように運転して容器詰め飲料を製造する。

【００２３】前述したように、本実施態様に係る容器詰め飲料の製造方法は、第１プレート式熱交換器３２により被処理飲料をその沸点近傍の温度にまで急速に加熱する。この際、水溶液中における気体の溶解度は温度の上昇とともに減少するため、熱交換器３２による加熱により溶存酸素のほとんどが過飽和ないし微細気泡の状態となる。この状態の茶飲料が一時貯留槽３４へ放出されることにより、前記液中酸素が該貯留槽３４上部のヘッドスペース部分に放出される。従って、該ヘッドスペースガスを除去することにより、茶飲料中の溶存酸素のほとんどが除去されることとなる。

【００２４】例えば、図４にはイオン交換水の溶存酸素と温度の関係が示されている。同図より明らかなように、２０℃で９ppm 程度の溶存酸素が存在していたものが、温度６０℃では５ppm 、温度９５℃では溶存酸素濃度が１ppm 程度となる。従って、調合タンク２４内の茶飲料の温度が６０℃であると溶存酸素が５ppm であったのが、熱交換器３２中で茶飲料が９５℃まで昇温されると溶存可能酸素が１ppm となるのであるから、差分４ppm の余剰溶存酸素は過飽和ないし微細気泡状となる。溶存酸素２ppm 以下は茶類缶詰の品質上大きな意義をもっており、特に１ppm 以下というのは例えば茶飲料等においても長期にわたり変質が極めて生じにくく、保存性向上に非常に効果的な酸素濃度である。この状態で一時貯留槽３４に注入されると、前記余剰溶存酸素は該貯留槽３４のヘッドスペース部分に放出される。

【００２５】一方、貯留槽３４内には窒素ボンベ６０からフィルターで除菌された無菌の窒素ガスが供給されており、前記ヘッドスペース部分へ茶飲料中から放出された空気（酸素）は窒素ガスとともに開口３４ａから系外へ排出される。そして、溶存酸素が例えば２ppm 以下まで低減された調合液は、圧送ポンプ３６により第２プレート式熱交換器３８に送給される。該熱交換器３８は前記第１プレート式熱交換器３２と同様の熱交換器から構成されるが、調合液の常圧沸点以上の高温とするため、ポンプ３６は調合液が沸騰しないように加圧を行っている。

【００２６】以上のようにして得られた溶存酸素濃度２ppm 以下の茶飲料は、直ちに第３プレート式熱交換器４０により冷却された後、圧力制御弁４２を介して無菌充填装置４４に供給される。該無菌充填装置４４は無菌室及び該無菌室内に設置された充填装置及び密封装置で構成され、無菌容器に茶飲料を充填・密封する。なお、前記無菌充填装置４４にも前記窒素ボンベ６０から途中のフィルターを通過し除菌された無菌の窒素ガスが供給さ

れており、実質的に酸素との接触が絶たれた状態で茶飲料は缶に充填され、缶蓋で密封される。

【００２７】以上説明したように、本実施態様に係る容器詰め飲料の製造方法によれば、常圧下で被処理飲料をその沸点近傍で滞留させ、この間に脱気を行い、さらに加圧、高圧下で十分な殺菌を行うため、無菌充填装置４４により充填される調合液は十分に殺菌、脱気されたものとなる。なお、本実施態様においては無菌の窒素ガスは貯留槽３４のヘッドスペース部分に供給されたが、例えば一時貯留槽３４内でバブリングすることも好適である。また、より脱気の完全を図るために、本実施態様においては無菌の窒素ガスを調合タンク２４内にも供給している。

【００２８】また、本実施態様においては一時貯留槽３４および無菌充填装置４４に酸素濃度計６４を設け、各工程における酸素濃度が一定以上とならないように窒素ガス供給量を制御することにより、さらに安定した脱気効果を得ている。なお、本実施態様において一時貯留槽３４としては例えば図５に示すような構造のものを用いることが好適である。

【００２９】すなわち、同図に示す一時貯留槽３４は、貯留槽３４下部に流入路７０、およびその反対側の下部に流出路７２を設け、両流路７０，７２の間には隔壁７４が設けられている。このため、流入路７０から流入する飲料は隔壁７４に妨げられて一度液面（ヘッドスペースとの接触面）に至り、十分な脱気が行われたのち流出路７２から第２プレート式熱交換器３８へ送給される。このため、一時貯留槽３４内部で液溜まりが生じることなく、しかも脱気効率も高くなる。

【００３０】

【実施例】以下、図６に基づき本発明の一実施例について説明する。同図に示す実施例においては、溶存酸素濃度０．９ppm のイオン交換水に煎茶を１．２５％添加し、７０℃で５分間抽出処理を行った後、濾過、冷却、重曹およびＬ－アスコルビン酸の添加を行って茶飲料が調合される。この調合済茶飲料は、脱気イオン交換水を使ったにも関わらず、溶存酸素濃度は６．０ppm となっている。これに対して、従来一般的に用いられているレトルト殺菌法を用いて殺菌を行った場合（従来技術１）には、ホットパック（充填温度９０℃）時の溶存酸素濃度は１．６ppm 、さらにレトルト殺菌（１２１℃×１０分）の後の溶存酸素濃度は０．４ppm であった。

【００３１】また、前記調合済茶飲料をそのまま高温短時間殺菌し常温充填した場合（従来技術２）には、充填後の溶存酸素濃度は５．１ppm であり、溶存酸素濃度が極めて高く保存中の酸化が予想される。一方、前記調合済茶飲料を、本発明に係る方法で缶に充填しヘッドスペースを窒素ガスで置換した場合、一時貯留槽３４における溶存酸素濃度は１．８ppm 、さらに高温・高圧殺菌を行い常温充填した後の溶存酸素濃度は０．９ppm であった。

【００３２】以上の様にして製造した茶飲料について、ａ値およびＬ－アスコルビン酸の変化量をそれぞれ調合時（殺菌前）、製造時（殺菌後）、室温１カ月保存時、室温３カ月保存時に調査した。その結果を次の表１および表２に示す。

【００３３】

【表１】

ａ値の変化量

貯蔵期間	製造区分		
	従来技術１	従来技術２	本発明
調合時（殺菌前）	０．００		
製造時（殺菌後）	１．４１	０．２１	０．１５
室温×１ヶ月	２．０３	０．６３	０．１９
室温×３ヶ月	２．４２	０．８０	０．２２

なお、ａ値はＬａｂ測色系で、色相（赤－緑）を表し、ａ値が増加することにより褐変度合いが増加したことを示している。

【００３４】

【表２】

Ｌ－アスコルビン酸の変化量（単位ｍｇ％）

貯蔵期間	製造区分		
	従来技術１	従来技術２	本発明
調合時（殺菌前）	０．００		
製造時（殺菌後）	４．８６	３．５０	０．８６
室温×１ヶ月	７．０３	９．７８	１．５２
室温×３ヶ月	９．３２	１０．８０	２．１６

【００３５】

【表３】

フレーバーテスト結果（三点識別嗜好法）

貯蔵期間		テスト区分		
		従来技術１：従来技術２	従来技術１：本発明	従来技術２：本発明
製造時（殺菌後）	識別	＊＊＊	＊＊＊	＊＊
	嗜好	従来技術２を好む ＊＊＊	本発明を好む ＊＊＊	本発明を好む ＊＊
室温１ヶ月	識別	＊＊	＊＊＊	＊＊
	嗜好	従来技術２を好む ＊＊	本発明を好む ＊＊＊	本発明を好む ＊＊
室温３ヶ月	識別	＊＊	＊＊＊	＊
	嗜好	従来技術２を好む ＊	本発明を好む ＊＊＊	本発明を好む ＊

＊＊＊　：危険率０．１％で有意差有り。
＊＊　　：危険率１．０％で有意差有り。
＊　　　：危険率５．０％で有意差有り。

【００３６】なお、官能検査は発明者の所属する研究所の日常的に訓練された研究員２０人で１人３回繰り返しテストを行った。前記表１および表２より明らかなように、レトルト殺菌法を用いた従来技術１はａ値およびＬ－アスコルビン酸の変化量とも極めて大きく、さらに前記表３に示すとおりフレーバーテストの結果によっても著しく飲料の劣化が進んでいることが明らかとなった。なお、前記図６を参照すると、従来技術１においては充填後の溶存酸素濃度が０．４ppm とかなり低いが、これは溶存酸素が殆どレトルト殺菌中に反応・消費されたことを示唆するものであり、さらに充填後の溶存酸素が少ないにもかかわらず貯蔵中の変質が急速に進むことが明らかとなった。

【００３７】一方、従来技術２においては、ａ値の変化を見ると、前記従来技術１ほどの大幅な変化量は示さないが、図６に示したように充填後の溶存酸素濃度が著しく高いことから貯蔵中におけるＬ－アスコルビン酸の消費が著しく、またａ値も漸増することが理解される。こ

れらの従来技術１，２に対して本発明は充填後の溶存酸素濃度も低く、さらにａ値およびＬ－アスコルビン酸の変化量共に前記従来技術に比較して著しく小さく、品質の大幅な改善および維持が図られていることが明らかである。

【００３８】なお、前記実施態様および実施例においては茶飲料を例に取り説明したが、本発明はこれに限られるものではなく、コーヒー（ミルク入り、ブラック共）、茶類飲料（煎茶、ウーロン茶、紅茶）、麦茶、各種混合茶、ココア、ミルクセーキ、スープ、牛乳（乳飲料）、豆乳、甘酒、味噌汁等の現在レトルト殺菌の対象となっている飲料、さらには果実飲料、スポーツ飲料、殺菌乳酸菌飲料、トマト・野菜ジュース等の高温短時間殺菌およびホットパック法の対象となっている缶飲料についても適用可能であることは言うまでもない。さらに、前記実施態様においては熱交換器としてプレート式熱交換器を用いたが、例えば細管式熱交換器を用いることも可能である。

【００３９】

【発明の効果】以上説明したように本発明に係る容器詰め飲料の製造方法によれば、被処理飲料の沸点近傍まで余熱した後常圧下に保持して脱気し、さらにその後高温、加圧下に十分な殺菌を行うこととしたので、高温短時間殺菌において十分な脱気を行うことが可能となる。従って、本発明方法により飲料の調合時の色調、フレーバーを殆ど損なわずに製造でき、また容器詰め飲料の貯蔵中においても溶存酸素が少ないため上記の成分を安定して保存することが可能となる。また、本発明に係る容器詰め飲料の製造装置によれば、調合時の色調、フレーバーを殆ど損なわずに容器詰め飲料が製造できる。

【図面の簡単な説明】

【図１】本発明の一実施態様に係る容器詰め飲料の製造方法に用いられる缶飲料製造装置の概略構成図である。

【図２】図１に示す予熱手段、殺菌手段、冷却手段に用いられる熱交換器の概念の説明図である。

【図３】図１に示した装置に用いられるプレート式熱交換器の説明図である。

【図４】イオン交換水の温度と溶存酸素濃度の関係の説明図である。

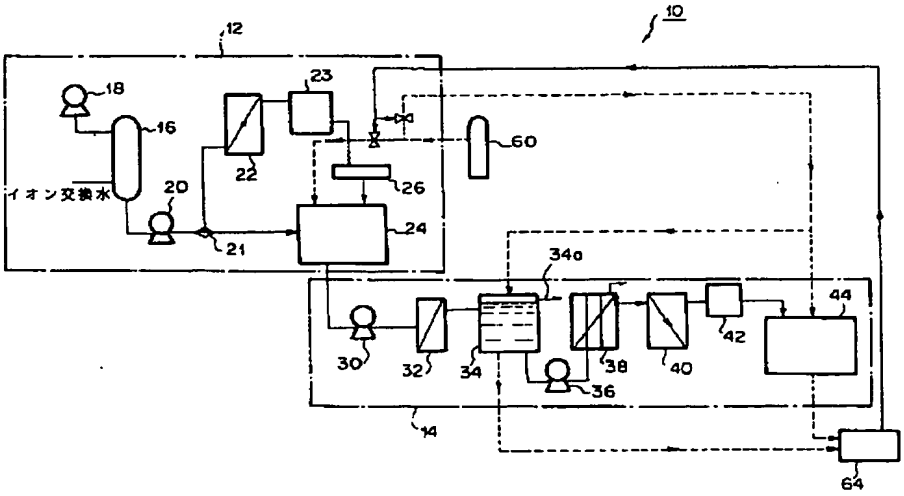
【図５】図１に示した装置に用いられる一時貯留槽の説明図である。

【図６】本発明と従来技術の煎茶缶詰製造工程および溶存酸素濃度の比較図である。

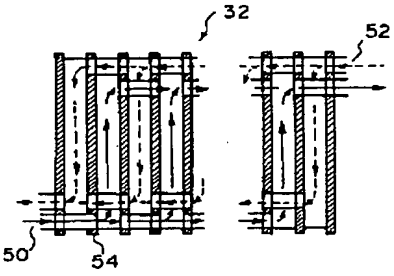
【符号の説明】

１４　飲料脱気・殺菌・充填・密封装置
３０　送給ポンプ（送給手段）
３２　第１プレート式熱交換器（予熱手段）
３４　一時貯留槽（脱気手段）
３６　圧送ポンプ（圧送手段）
３８　第２プレート式熱交換器（殺菌手段）
４０　第３プレート式熱交換器（冷却手段）
４４　無菌充填装置（無菌充填手段）

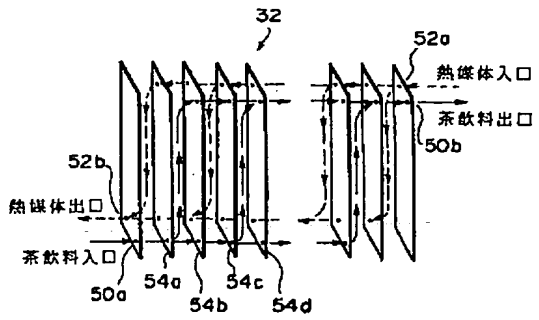
【図１】



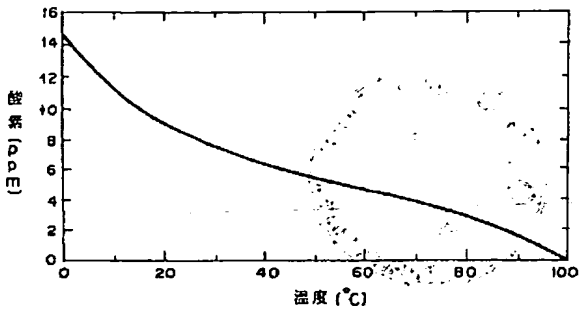
【図２】



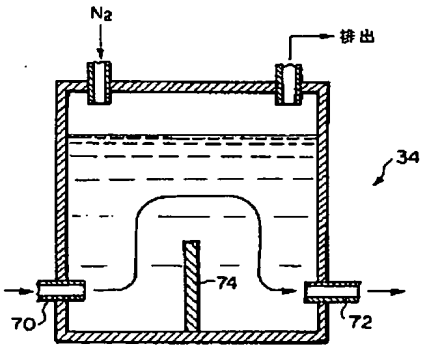
【図３】


32
52a
熱媒体入口
茶飲料出口
50b
52b
熱媒体出口
茶飲料入口
50a
54a
54b
54c
54d

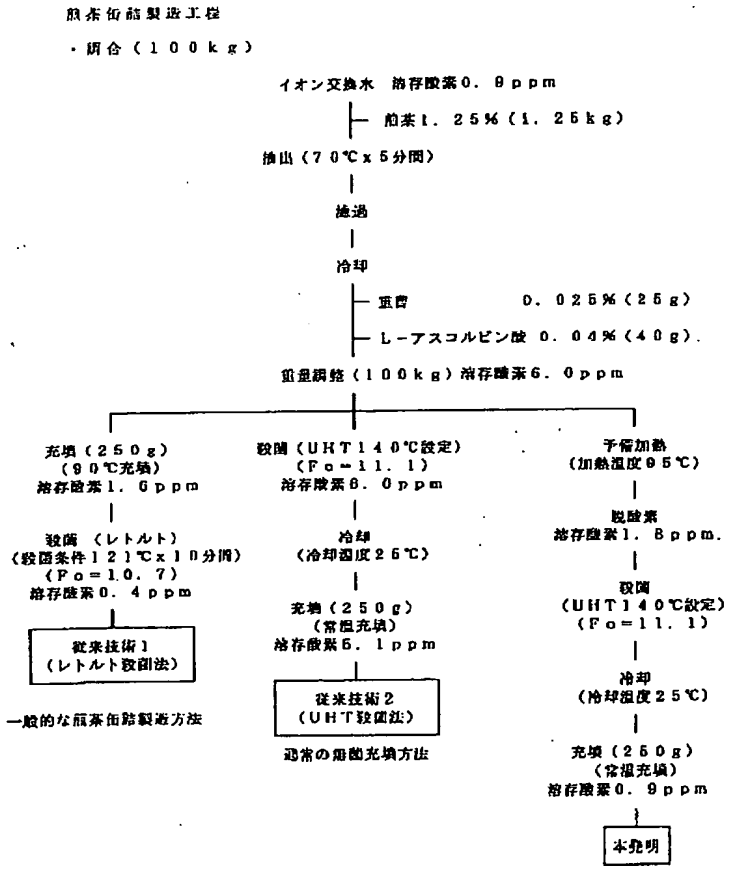
【図４】


酸素 (ppm)
温度 (℃)
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100

【図５】


N2
排出
34
74
70
72

【図６】


茶系缶飲料製造工程
・調合（１００ｋｇ）
イオン交換水　溶存酸素０．８ｐｐｍ
茶葉１．２５％（１．２５ｋｇ）
抽出（７０℃ｘ５分間）
濾過
冷却
重曹　０．０２５％（２５ｇ）
Ｌ－アスコルビン酸　０．０４％（４０ｇ）
重量調整（１００ｋｇ）溶存酸素６．０ｐｐｍ
充填（２５０ｇ）
（９０℃充填）
溶存酸素１．６ｐｐｍ
殺菌（レトルト）
（殺菌条件１２１℃ｘ１０分間）
（Ｐｏ＝１０．７）
溶存酸素０．４ｐｐｍ
従来技術１
（レトルト殺菌法）
一般的な瓶茶缶詰製造方法
殺菌（ＵＨＴ１４０℃設定）
（Ｆｏ＝１１．１）
溶存酸素８．０ｐｐｍ
冷却
（冷却温度２５℃）
充填（２５０ｇ）
（常温充填）
溶存酸素５．１ｐｐｍ
従来技術２
（ＵＨＴ殺菌法）
通常の無菌充填方法
予備加熱
（加熱温度９５℃）
脱酸素
溶存酸素１．８ｐｐｍ
殺菌
（ＵＨＴ１４０℃設定）
（Ｆｏ＝１１．１）
冷却
（冷却温度２５℃）
充填（２５０ｇ）
（常温充填）
溶存酸素０．９ｐｐｍ
本発明